

REMARKS

Introduction

Claims 1-20 were originally pending in this application. In response to the August 18, 2004 Office Action, Claims 1, 7, 13 and 19 have been amended. Claims 1-20 remain in this application.

Amendments to the Specification

Paragraph [0040] has been amended to correct a typographical error in the last line of the paragraph. No new matter has been added.

Claim Rejections

35 U.S.C. §103(a)

Claims 1, 2, 4-8, 11-13, 15 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Loughlin '904 patent in view of the Heart et al. '457 patent. Similarly, claims 10 and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Loughlin '904 patent in view of the Heart et al. '457 patent as applied to claims 1, 2, 4-8, 11-13, 15 and 16 further in view of the Fangman '929 patent. Claim 17 was also rejected under 35 U.S.C. § 103(a) as being unpatentable over the Loughlin '904 patent in view of the Heart et al. '457 patent as applied to claims 1, 2, 4-8, 11-13, 15 and 16 further view of the DeBiasse '544 patent. Additionally, claims 3, 9 and 18-20 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over the Loughlin '904 patent in view of the Heart et al. '457 patent as applied to claims 1, 2, 4-8, 11-13, 15 and 16 further view of the Lindstrom '285 patent. Applicants respectfully traverse these rejections.

The Prior Art

The Loughlin '904 Patent

The Loughlin '904 patent discloses a method of assembling a piston and connecting rod using a stepped wrist pin. Specifically, the method employs a temperature differential between a stepped wrist pin 18 and the connecting rod (Figures 1 - 3) or between the stepped wrist pin 84 and the piston 80 (Figures 4 - 5) to operatively couple a connecting rod 14 to a piston 12. The wrist pin 18 includes two end journals 36, 38 and an intermediate journal 40 having a relatively smaller diameter disposed therebetween (Figures 1 - 3). On the other hand, the wrist pin 84 includes end journals 88 and 90 with an intermediate journal 86 having a relatively larger diameter disposed therebetween (Figures 4 - 5). The stepped wrist pins 18, 84 attach the connecting rod 14 or 82 to the piston 12 or 80 upon reaching an ambient temperature, thereby eliminating the need for additional components such as lock rings, which cause engine failure when broken or misassembled. (Column 1, lines 34-65). The Loughlin '904 patent further discloses the use of a bushing 42,106 to provide relative turning movement between the wrist pin 18 or 84 and connecting rod 14 or 82, which facilitates improved connection. (Column 3, lines 30-49).

Thus, the Loughlin '904 patent teaches a method for assembling a piston to a connecting rod having a bushing with a stepped wrist pin that is assembled using thermal expansion and/or contraction to accommodate installation of a stepped wrist pin. The use of a bushing between the wrist pin and connecting rod is a conventional assembly that is well known in the art and was distinguished from the present invention in the background section of this patent application.

However, the Laughlin '904 patent does not disclose or suggest a bushingless pivot surface between the piston pin and connecting rod. In fact, the Laughlin '904 patent argues the importance of employing a bushing. (Column 3, lines 29-63 and Column 5, lines 39-44). Because it teaches the use of a bushing, the Laughlin '904 patent neither discloses nor suggests a bushingless connecting rod including a phosphatized coating to facilitate relative angular movement between the connecting rod and a profiled piston pin as required by independent claim 1, as amended. Nor does the Laughlin '904 patent disclose or suggest a piston pin having a profiled outer circumference that includes a phosphatized coating as required by independent claim 7, as amended. Moreover, the Laughlin '904 patent neither discloses nor suggests the combination of a piston pin having a profiled outer circumference and a bushingless connecting rod having a first end, a second end and an internal gallery fixedly therebetween to direct lubricant between the first and second ends as required by independent claims 12 and 18.

The Heart et al. '457 Patent

The Heart et al. '457 patent discloses a bushingless piston and connecting rod assembly coupled by a wrist pin. Both the assembly and the wrist pin include a running surface, where at least one of these running surfaces includes a manganese phosphate coating. The Heart et al. '457 patent employs a manganese phosphate coating 36 in lieu of a bushing within heavy-duty diesel engines where the tribological properties of the diesel engine tend to corrode traditional bushings and to more directly place the load during operation onto the parent materials of the connecting rod and wrist pin. The manganese phosphate coating 36 includes a thickness of about 8.0 to 15.0 μm , an application weight of about $2.15 \pm 1.08 \text{ mg/cm}^2$, and a grain size of about $30 \pm 15 \mu\text{m}$. The manganese phosphate coating 36 is applied to the running surface 34 of the wrist pin 32

to act on the steel running surfaces 22 and 30 of the piston body 12 and connecting rod 24, respectively (Figs. 1-2). Alternatively, the manganese phosphate coating 136 is applied to the running surface 122 of the piston body 112 or the running surface 130 of the connecting rod 124 to act on the steel running surface 134 of the wrist pin (Fig. 3).

However, the Heart et al. '457 patent does not disclose or suggest the use of a profiled piston pin having an outer circumference that is substantially circular in cross-section with a larger diameter at the distal ends than at the center portion for use in connection with a connecting rod including a phosphatized coating having a thickness between two and less than eight microns as required by independent claims 1 and 7, as amended. Rather, the Heart et al. '457 patent teaches away from the present invention by arguing the importance of a manganese phosphate coating having a thickness between 8.0 to 15.0 μm (Column 3, lines 9-12). Furthermore, the Heart et al. '457 patent neither discloses nor suggests a connecting rod having an internal gallery to direct lubricant between the first and second ends of the connecting rod as required by independent claims 12 and 18.

The Lindstrom '285 Patent

The Lindstrom '285 patent discloses a lubrication system for a connecting rod 42, piston 44, and wrist pin 46 used in a hermetic refrigeration compressor motor 8. The Lindstrom connecting rod 42 has three oil ports 64, 66, 68 to direct oil toward the inner surfaces 72, 77 of the piston 44 and piston crown 60, respectively, as well as toward the wrist pin 46 during operational movement of the connecting rod 42 within the cylinder 14 of a hermetic refrigeration compressor motor 8.

However, the Lindstrom '285 patent does not make up for the deficiencies of the Laughlin '904 and Heart et al. '457 patents. Specifically, the Lindstrom '285 patent neither discloses nor suggests a piston pin having a profiled outer circumference that includes a phosphatized coating bonded thereto for use in connection with a connecting rod employed within an internal combustion engine as required by independent claim 18. Further, the Lindstrom '285 patent does not disclose or suggest a bushingless pivot surface between the piston pin and connecting rod of an internal combustion engine.

The Fangman '929 and DeBiasse '544 Patents

The Fangman '929 patent is cited as disclosing a tapered connecting rod and bore housing. On the other hand, the DeBiasse '544 patent is cited for disclosing side relief channels along the inner circumference of the pin bore.

The Present Invention

In contrast to the references of record in this case, the present invention as defined in independent claim 1, as amended, is directed toward a piston and connecting rod assembly for use with an internal combustion engine. The assembly includes a piston having a body including a pin bore and a connecting rod to interconnect the piston and a crankshaft. The connecting rod has first and second ends with at least one of the ends including a bore extending therethrough and adapted to be aligned with the pin bore within a piston. The assembly further includes a pin that is received through the aligned pin bore of the piston and the bore extending through the end of the connecting rod. The pin includes a pair of distal ends, a center portion formed therebetween and a profiled outer circumference that is substantially circular in cross-section

with a larger diameter at the distal ends than at the center portion. The end of the connecting rod that is aligned with the piston pin bore includes a phosphatized coating to facilitate relative angular movement between the bore extending through the connecting rod and the outer circumference of the profiled piston pin. The phosphatized coating has a thickness between two and less than eight microns. In addition, the present invention as defined in independent claim 7, as amended, is directed toward a piston and connecting rod assembly as described above where the profiled outer circumference of the pin includes a phosphatized coating having a thickness between two and less than eight microns and the end of the connecting rod that is aligned with the piston pin bore does not include a phosphatized coating.

The present invention as defined in independent claim 12 is also directed toward a piston and connecting rod assembly for use with an internal combustion engine. The connecting rod includes an internal gallery extending between the first and second ends to direct lubricant therebetween. The end of the connecting rod that is aligned with the piston pin bore includes a phosphatized coating to facilitate relative angular movement between the bore extending through the connecting rod and the outer circumference of the profiled piston pin. Similarly, the present invention as defined in independent claim 18 is directed toward a piston and connecting rod assembly as described above where the profiled outer circumference of the pin includes a phosphatized coating and the end of the connecting rod that is aligned with the piston pin bore does not include a phosphatized coating.

Argument

A rejection based on §103 must rest on a factual basis, with the facts being interpreted without a hindsight reconstruction of the invention from the prior art. Thus, in the context of an

analysis under § 103, it is not sufficient merely to identify one reference that teaches several of the limitations of a claim and another that teaches several limitations of a claim to support a rejection based on obviousness. This is because obviousness is not established by combining the basic disclosures of the prior art to produce the claimed invention absent a teaching or suggestion that the combination be made. Interconnect Planning Corp. v. Fiel, 774 F.2d 1132, 1143, 227 U.S.P.Q. (BNA) 543, 551 (Fed. Cir. 1985); In Re Corkhill, 771 F.2d 1496, 1501-02, 226 U.S.P.Q. (BNA) 1005, 1009-10 (Fed. Cir. 1985). The relevant analysis invokes a cornerstone principle of patent law:

That all elements of an invention may have been old (the normal situation), or some old and some new, or all new, is however, simply irrelevant. Virtually all inventions are combinations and virtually all are combinations of old elements. Environmental Designs v. Union Oil Co. of Cal., 713 F.2d 693, 698 (Fed. Cir. 1983) (other citations omitted).

A patentable invention . . . may result even if the inventor has, in effect, merely combined features, old in the art, for their known purpose without producing anything beyond the results inherent in their use. American Hoist & Derek Co. v. Sowa & Sons, Inc., 220 U.S.P.Q. (BNA) 763, 771 (Fed. Cir. 1984) (emphasis in original, other citations omitted).

As the Court of Appeals for the Federal Circuit recently noted, “[w]hen a rejection depends upon a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references.” Ecolochem, Inc. v. Southern Calif. Edison, 56 U.S.P.Q. 2d 1065, 1073 (Fed. Cir. 2000). Here, there is simply no motivation provided in any of the Laughlin, Heart et al., or Lindstrom patents to combine their teachings. Furthermore, even assuming that such a motivation existed, a combination of these references would not result in

the piston and connecting rod assembly of the type described in independent claims 1, 7, 12 and 18.

It is respectfully submitted that the Laughlin, Heart et al., and Lindstrom patents references skirt around, but do not suggest the claimed invention *as a whole*. See Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1383 (Fed. Cir. 1986). Further, it is respectfully submitted that one must pick and choose elements from the structurally dissimilar devices disclosed in the Laughlin, Heart et al., and Lindstrom patents and combine these elements by restructuring them, using hindsight and the applicants' own disclosure, to conclude that the claimed invention is obvious. Applicants respectfully submit that this would be improper in view of the disclosures of the prior art.

There is a fundamental axiom in patent law that if a reference must be reconstructed or rearranged to change its operation to meet the applicants' claim, that modification of the reference is inappropriate and cannot stand. The Laughlin '904 patent discloses a method for assembling a piston and connecting rod using a stepped wrist pin but employs a bushing to facilitate contact between the connecting rod and stepped wrist pin. On the other hand, the Heart et al. '457 patent discloses a bushingless piston and connecting rod assembly using a manganese phosphate coating having a thickness of between 8 and 15 μm in lieu of a bushing to eliminate corrosion within a diesel engine and directly place the load onto the wrist pin and connecting rod. This is entirely contrary to the use of a bushing taught by Laughlin. Accordingly, the Laughlin and Heart et al. patents are diametrically opposed and would have to be reconstructed or rearranged to change their operations if they were to be combined.

Furthermore, the coating thickness disclosed by the Heart et al. '457 patent is excessive. A coating thickness between 8 and 15 microns within the small end pin bore, piston pin bore or

piston pin reduces reliability at this pivot point as well as the entire engine as a whole. Specifically, the tolerances between the components that comprise the small end pivot point (i.e. the small end pin bore, piston pin and piston pin bore) account for the coating thickness by reducing the thickness of the components at this pivot point. However, since manganese phosphate is relatively soft compared to the piston pin, connecting rod or a piston pin bore, the coating wears quickly when subjected to the operating conditions within a cylinder of an internal combustion engine. As the coating begins to wear, the tolerances between the components at the small end pivot point increases. The increased tolerance results in vibration, engine noise and premature wear, which reduces the life of the engine. On the other hand, independent claims 1 and 7, as amended, teach a manganese phosphate coating between two and less than eight microns. In contrast to the teachings of Heart et al., when a manganese phosphate coating thickness between two and less than eight microns begins to wear, the tolerance increase between the engine components does not result in significant vibration, engine noise or premature wear and thus, does not affect the life of the engine.

Additionally, the Heart et al. '475 patent does not teach or suggest the use of a profiled piston pin or a connecting rod having an internal gallery as required by independent claims 12 and 18. Furthermore, the Lindstrom '285 patent teaches the use of three oil ports within a connecting rod. This bears no relation to the combination of a profiled piston pin and a bushingless connecting rod including a phosphatized coating for use within an internal combustion engine as required by independent claim 1, and amended, and independent claim 12. The DeBiasse '544 and the Fangman '929 patents do not make up for the deficiencies of the Laughlin '904, Heart et al. '457 and Lindstrom '285 patents nor do they suggest the subject invention. Thus, applicants respectfully submit that the disclosures of each of these references

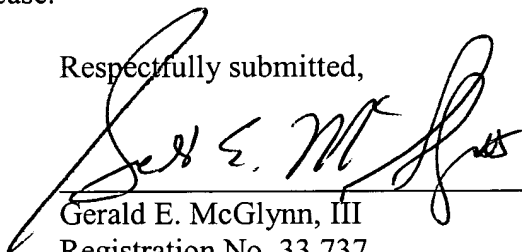
would have to be improperly modified to meet the limitations of independent claims 1 and 7, as amended, as well as independent claims 12 and 18.

Claims 2 – 6, 8 – 11, 13 – 17, 19 and 20 are all ultimately dependent upon independent claims 1, 7, 12 and 18, respectively, and add further perfecting limitations. However, even if they did, they could only be applied through hindsight after restructuring the disclosure of the prior art in view of applicants' invention. A combination of the prior art in this way to derive applicants' invention would, in and of itself, be an invention.

Conclusion

In view of the above, applicants respectfully submit that the claims clearly distinguish over the prior art and are therefore allowable. Accordingly, applicants respectfully solicit the allowance of the claims pending in this case.

Respectfully submitted,



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